CLAIMS:

1. An evanescent wave cavity-based optical sensor, the sensor comprising:

an optical cavity formed by a pair of highly reflective surfaces such that light within said cavity makes a plurality of passes between said surfaces, an optical path between said surfaces including a reflection from a totally internally reflecting (TIR) surface, said reflection from said TIR surface generating an evanescent wave to provide a sensing function;

a light source to inject light into said cavity; and

a detector to detect a light level within said cavity; and

wherein said TIR surface is provided with an electrically conducting material over at least part of said TIR surface such that said evanescent wave excites a plasmon within said material;

whereby a change in absorption of said evanescent wave due to a change in said plasmon excitation is detectable using said detector to provide said sensing function.

2. An evanescent wave cavity ring-down sensor comprising:

a ring-down optical cavity including an attenuated total-internal-reflection based sensing device for sensing a substance modifying a ring-down characteristic of the cavity;

a continuous wave light source for exciting said cavity; and

a detector for monitoring said ring-down characteristic; and

wherein said sensing device is provided with an electrically conducting material adjacent a total internal reflection (TIR) interface of said device such that an evanescent wave at said interface generates a plasmon excitation within said material, said plasmon excitation being modifiable by said sensed substance to modify said cavity ring-down characteristic.

3. A sensor as claimed in claim 1 or 2 wherein said optical cavity comprises a fibre optic sensor configured to provide an evanescent field from light guided within the fibre to said conducting material to excite said plasmon for said sensing.

4. A sensor as claimed in claim 1, 2 or 3 wherein said conducting material comprises one or more of islands of conducting material, particles and aggregates; and wherein said plasmon comprises a localised or particle plasmon.

5. A sensor as claimed in claim 1, 2, 3 or 4 wherein said electrical conducting material comprises metallic regions having an average size of less than 50 μm.

6. A sensor as claimed in claim 5 wherein said regions comprise irregular islands.

7. A sensor as claimed in claim 1, 2, 3 or 4 wherein said electrical conducting material comprises metallic particles having an average size of less than 50 nm.

8. A sensor as claimed in any one of claims 4 to 7 wherein said light source is configured to provide light at two wavelengths straddling said plasmon excitation.

9. A sensor as claimed in claim 1, 2 or 3 wherein said conducting material comprises a substantially continuous film and wherein said plasmon comprises a surface plasmon.

10. A sensor as claimed in any preceding claim wherein said conducting material is bound to said TIR surface/interface by a molecular link.

11. A sensor as claimed in any preceding claim wherein said conducting material comprises gold.

12. A sensor as claimed in any preceding claim further comprising a functionalising material associated with said conducting material to provide a selective response for said evanescent wave surface plasmon sensing.

13. A sensing device as recited in any one of claims 1 to 12.

14. A sensor for a cavity of an evanescent-wave cavity ring down device, the sensor comprising a fibre optic cable having a core configured to guide light down the fibre surrounded by an outer cladding of lower refractive index than the core, wherein a sensing portion of the fibre optic cable is configured have a reduced thickness cladding provided with an electrically conducting material such that an evanescent wave from said guided light is able to excite a plasmon within said material.

15. An optical cavity-based sensing device comprising:

an optical cavity absorption sensor comprising an optical cavity formed by a pair of reflecting surfaces;

a light source for providing light to couple into said cavity; and

a light detector for detecting a level of light escaping from said cavity;

wherein said optical cavity includes a plasmon-based sensing device, said device comprising a layer of conducting material with a functionalised surface.

16. A cavity ring-down sensor comprising:

a ring-down optical cavity for sensing a substance modifying a ring-down characteristic of the cavity;

a light source for exciting said cavity; and

a detector for monitoring said ring-down characteristic; and

wherein said optical cavity includes surface a plasmon-based sensing device, said sensing device comprising a layer of conducting material with a functionalised surface.

17. A sensor as claimed in claim 15 or 16 wherein said functionalised surface is configured to provide a selective sensing response for the sensor.

18. A sensor as claimed in claim 15, 16 or 17 wherein said functionalised surface comprises a protein.

19. A sensor as claimed in claim 15, 16 or 17 wherein said functionalised surface comprises a monoclonal or polyclonal antibody.

20. A sensor as claimed in claim 15, 16 or 17 wherein said functionalised surface comprises a DNA and/or RNA.

21. A method of refreshing a plasmon-based sensing device, the device comprising a layer of conducting material optionally with a functionalised surface, the method comprising applying an electrical charge or potential to the conducting material to refresh the device.

22. A method as claimed in claim 21 further comprising switching said electrical charge or potential between a first, sensing state and a second, refreshing state.

23. A method as claimed in claim 22 wherein said switching comprises reversing said electrical charge or potential.

24. A plasmon-based sensing device comprising a sensing surface bearing a layer of conducting material, and including a sensing surface refresh system.

25. A plasmon-based sensing device as claimed in claim 24 wherein said layer of conducting material has a functionalised surface.

26. A plasmon-based sensing device as claimed in claim 24 or 25 wherein said sensing surface refresh system comprises a system for applying an electrical charge or potential to the conducting material to refresh the device.